

# A REVISION OF THE PANAMANIAN SPECIES OF *RONDELETIA* (RUBIACEAE)<sup>1</sup>

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## ABSTRACT

A key to and descriptions of the Panamanian taxa of *Rondeletia* are given; two new taxa are described.

## INTRODUCTION

The genus *Rondeletia* was first described by Plumier (1703) and named in honor of the physician Guillaume Rondelet of Montpellier, and it was subsequently taken up by Linnaeus (1753). Several other generic names were introduced after this.

Planchon (1849) divided *Rondeletia* into three genera, creating two new ones, *Rogiera* and *Arachnothryx*. He based the separation principally on the condition of the orifice of the corolla and the number of floral limbs. *Rondeletia* was 5-merous with an annular callosity at the orifice of the corolla, *Rogiera* was 5-merous with the orifice of the corolla yellow-bearded, and *Arachnothryx* was 4-merous with the orifice of the corolla nude and the indumentum generally arachnoid-tomentose.

Hooker (1873) reduced *Rogiera* to synonymy under *Rondeletia* and made *Arachnothryx* a section of the genus. Schumann (1891) followed his lead. Standley (1918), in his revision of *Rondeletia* in North America, reduced both genera to synonymy, establishing the generic limits that have been accepted to the present. Steyermark (1967) resurrected *Arachnothryx* and transferred many South American species into it. He did not consider the species from Central America, Mexico, or the West Indies, which seem to form the major evolutionary centers of the genus. To evaluate the situation properly, it is essential that the species in these areas be studied critically.

Since Standley's revision of the genus for North America, six new species of *Rondeletia* have been described from Panama, three by Standley and three by Dwyer & Hayden.

## FLORAL AND FRUIT MORPHOLOGY

The flowers provide the majority of the diagnostic characters. The number of floral limbs can be important, but it must be used with caution due to the

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variability in the number of limbs. The calyx lobes are the most valuable character at the specific level in Panama. They are extremely variable between species in size and shape and are stable enough within the species to make adequate specific determinations. The corolla is also used at both group and specific levels based on its indumentum, length, condition of the orifice, and number of limbs. Heterostyly has been found in one taxon from Panama, *R. salicifolia* Dwyer & Hayden subsp. *salicifolia*. Presumably it is rare in the genus, although readily occurring throughout the rest of the family without regard to phylogenetic relationships (Vuilleumier, 1967). The placenta shape is variable enough to separate some taxa and show relationships.

The mature fruit is one of the principal characters for generic determination. The shape and dehiscence are used at the group level, but at the specific level the fruit is of little use across the full range of the genus, although it has practical value in a key to the Panamanian species. It appears that the morphology of the ovules or seeds might be useful at the group level; they are either winged at one or both ends, or not winged.

#### DISCUSSION

*Rondeletia* is confined to the neotropics except for several species reported from the Himalayas. The two main evolutionary and distributional areas of the genus are Mexico-Central America and the West Indies. There is also a smaller center in northern South America. Panama is at the edges of the Mexico-Central American and the South American complexes having affinities with both.

The Panamanian species fall into two general phylogenetic patterns: 1) those species which while obviously related, as evidenced by morphological characters, represent the products of strongly divergent evolutionary lines; 2) a group of endemics whose close phylogenetic inter-relationships are currently extremely difficult to determine. Except for their calycine lobation, these endemics, viz. *R. salicifolia*, *R. cooperi*, *R. secunda*, *R. bertieroides*, and *R. platysepala*, are difficult to delimit as species. They exhibit certain similarities of structure in the following characters: 4-merous condition, septicidal capsules (*R. secunda* excepted), fruits up to 4 mm in diameter, corolla naked at the throat, ovules not winged, and one or more calyx lobes expanded.

The remaining seven Panamanian species of *Rondeletia* fall into the former phylogenetic pattern. Even *R. odorata* var. *breviflora*, *R. hamelifolia*, and *R. panamensis*, presumably closely related, show strong divergence in certain features: amount of pubescence, type of leaf, type of inflorescence, length of the calyx lobes, length of the corolla tube, shape of the fruit, and appendages on the ovules. In the Panamanian members of the genus, it is this type of divergence which allows the taxonomist to easily segregate these taxa as species. A world revision of *Rondeletia* may permit a more critical evaluation of the strength of these characters at the species level<sup>3</sup>.

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<sup>3</sup> The need for an overall monograph of this large genus and related taxa is obvious; what this study emphasizes first, however, is the necessity for major collecting particularly at higher elevations so that some understanding of the variation of species populations is possible.—Editor.



In his recent South American revision of *Rondeletia*, Steyermark (1967) resurrected the genus *Arachnothryx* Planchon. He effectively divided the species formerly assigned to *Rondeletia* between *Rondeletia* (12 species) and *Arachnothryx* (21 species). Because his generic key is so important in modern *Rondeletia* research, it is given below:

"Capsule loculicidally dehiscent; seeds fusiform, winged, caudate at one or both ends, the testa shallowly reticulate with elongated cells; orifice of corolla with a conspicuous thickened annular callosity; tube of corolla glabrous within; corolla-lobes 5; calyx-lobes 5; disk densely hirsutulous, projecting above the sinus at the base of the calyx-lobes, the calyx-tube not developed or obsolete; stipule inconspicuous, triangular or deltoid; pubescence of hypanthium, outer surface of corolla, or vegetative parts usually not pannose nor arachnoid-pubescent.

*Rondeletia.*

Capsule septicidally dehiscent; seeds rhomboidal to triangular, compressed, not winged nor caudate, the testa deeply foveolate and rugulose thickened with sunken pentagonal or hexagonal cells; orifice of corolla naked, without a thickened callosity; tube of corolla pubescent within in basal portion; corolla-lobes 4; calyx-lobes 4; disk usually glabrous, sunken below sinus at the base of the calyx-lobes, the calyx-tube obviously manifest; stipule conspicuously developed, oblong or oblong-lanceolate; pubescence of hypanthium or vegetative parts usually pannose or arachnoid-pubescent.

*Arachnothrix.*"

This key effectively deals with the species of *Rondeletia* in South America, but is open to criticism in the case of the Panamanian species. *Rondeletia secunda* matches the key for *Arachnothryx* except that it has loculicidally dehiscent fruit. Also, the key is not effective in separating those species which are bearded in the throat of the corolla such as *R. amoena* and *R. dukei*.

#### SYSTEMATIC TREATMENT

*Rondeletia* L., Sp. Pl. 172, 1753.

*Petesia* P. Br., Hist. Jamaica, 143, tab. 2 & 3, 1756.

*Lightfootia* Schreb., Gen. 122, 1789, non L'Her. (Sert. Angl. t. 4, 1788).

*Willdenovia* J. F. Gmel., Syst. 2: 362, 1791, non Thunb. (Vet. Akad. Handl. Stock. 11: 26, t. 2, 1790).

*Arachnimorpha* Desv. in Hamilt., Prodr. 28, 1825.

*Rogiera* Planchon, Fl. Serres 5: 442, 1849.

*Arachnothryx* Planchon, loc. cit.

*Shrubs* or trees, the branchlets terete or angular. *Stipules* interpetiolar, variable in length and width, rostrate, acute, acuminate, obtuse or cuspidate at the apex, entire or very rarely bilobate, usually persistent, erect or rarely reflexed. *Leaves* opposite, simple, sessile to pedicellate, the blade ovate, elliptic, obovate, oblong, or very rarely circular, obtuse, acute or acuminate at the apex, variable at the base, the venation pinnate with the secondary veins arcuate, anastomosing near the margin of the leaf, very rarely bullate between the secondary veins, tertiary veins running at right angles to the secondary veins or open reticulate, pubescent to glabrous above, densely pubescent to glabrous and the midrib and secondary veins generally raised beneath, entire, very rarely revolute at the margin, coriaceous, chartaceous or membranaceous. *Inflorescences* terminal or axillary, commonly paniculate, rarely thyrsoid or of compound dichasia or racemose or spike-like,



pedunculate. *Flowers* pedicellate to sessile; hypanthium rotund or oblong, with an annular disk; calyx-lobes 4-6(-7) often unequal, sometimes foliaceous, often basally connate, variable in length and width; corolla with the tube usually slender, variable in length, the throat bare, bearded or with an annular callosity, the 4-6 lobes usually spreading, obtuse, imbricate in the bud; stamens 4-6, alternate with the corolla-lobes, variably attached in the tube, the filaments sometimes of variable length, the anthers oblong, dorsifixed, introrse, with 4 thecae, included or rarely excluded; style rarely variable in length; stigma bilobate or very rarely trilobate; ovary 2- or very rarely 3-loculate, the septum fully fused or rarely incompletely fused; placenta axile, polymorphic interspecifically; ovules many. *Fruit* a capsule, globose or rotund or rarely transverse elliptic or ovoid, 2-celled, loculicidally or septicidally bivalvate, the valves often bipartite, the seeds many, minute, sometimes winged at one end or at both ends.

## KEY TO THE PANAMANIAN SPECIES OF RONDELETIA

- a. Leaves coriaceous, bullate, the margin revolute .....1. *R. odorata* var. *breviflora*
- aa. Leaves subcoriaceous, chartaceous, or membranaceous, non-bullate, the margin not revolute.
  - b. Leaves with the lower surface with a dense whitish- or grayish-indumentum.
    - c. Leaves densely grayish arachnoid-tomentose beneath; inflorescence a few-flowered modified thyrse, 4-5 cm long; calyx-lobes lanceolate, 10-13 mm long .....2. *R. darienensis*
    - cc. Leaves densely white-tomentose beneath; inflorescence racemose, 2.5-32 cm long; calyx-lobes triangular or oblong, 0.5-1.7 mm long ....3. *R. buddleioides*
  - bb. Leaves with the lower surface with a moderate to sparse indumentum, glabrate, or glabrous.
    - d. Stipules reflexed; leaves subcoriaceous; corolla-tube densely yellow-pilose in the throat .....4. *R. amoena*
    - dd. Stipules erect; leaves chartaceous or membranaceous; corolla-tube never yellow-pilose in the throat.
      - e. Flowers 4-merous; mature capsule to 4 mm in diam, septicidal (except *R. secunda*); seeds rectangular.
        - f. One calyx-lobe 2 or more times longer than the other 3 lobes; capsule globose, rotund or ovoid, costate or rugose, sparsely strigose, glabrate or glabrous.
          - g. Large calyx lobe 6-11.5 mm long, 3.5-6.5 mm wide, capsule globose, costate, glabrate when mature .....5. *R. salicifolia*
          - gg. Large calyx-lobe 2-7.4 mm long, 0.7-2.2 mm wide; capsule globose, rotund, or ovoid, costate or rugose, sparsely strigose or glabrous.
            - h. Hypanthium densely strigose; capsule ovoid, costate, sparsely strigose .....6. *R. cooperi*
            - hh. Hypanthium arachnoid-tomentose; capsule globose or rotund, costate or rugose, glabrous.
              - i. Small calyx-lobes linear or narrowly oblong, 1.7-4 mm long, 0.2-0.6 mm wide; capsule rotund, rugose when mature, glabrous, loculicidal .....7. *R. secunda*
              - ii. Small calyx-lobes triangular to broadly triangular or oblong, 0.3-1.8 mm long, 0.5-0.9 mm wide; capsule globose, costate, glabrous, septicidal .....8. *R. bertieroides*
      - ff. Calyx-lobes ca equal in length; (fruit not known) .....9. *R. platysepala*
    - ee. Flowers 5-merous or 5- & 6-merous; mature capsule (not seen for *R. dukei*) 8-10 mm in diam, loculicidal; seeds winged.



- j. All calyx-lobes on the inflorescence 1-9.5 mm long; annular callosity at the orifice of the corolla; placenta hemispherical.
- k. Calyx-lobes 5 or 6, 1-2 mm long; corolla-tube 6-9 mm long; capsule transversely elliptic in radial section .....10. *R. hamelifolia*
- kk. Calyx-lobes 5, ca 8.5 mm long; corolla-tube 13-18 mm long; capsule globose .....11. *R. panamensis*
- jj. Several calyx-lobes on the inflorescence to 3.8 cm long; no annular callosity at the orifice of the corolla; placenta oblong .....12. *R. dukei*

1. *Rondeletia odorata* Jacquin var. *breviflora* Hooker, Curtis Bot. Mag. tab. 6350, 1878.

*Shrub* with the branchlets terete, the younger portions ferrugineous-hirsute, the older portions brown and glabrous. *Stipules* broadly triangular with a rostrate apex, 2.2-3.9 mm long, 1.3-4 mm wide. *Leaves* sessile or subsessile, the petioles to 2 mm long; blade subovate to elliptic or subobovate, 1.8-4.7 cm long, 1-2.8 cm wide, subacute at the apex, subcordate at the base, coriaceous, densely scabrous above when young, sparsely scabrous above when older, bullate between the secondary veins, sparsely hirsute on the veins and the midrib and secondary veins prominently raised beneath, the tertiary veins open-reticulate, the margin revolute. *Inflorescences* terminal, contracted thyrses, 1-2.2 cm long, the floriferous portion of the axes with 2 basal foliar bracts 3-8 mm long and 2.5-5 mm wide; peduncles 3.2-7 mm long; axes ferrugineous-hirsute. *Flowers* pedicellate, the pedicels ca 2 mm long, with a linear bractlet to 4 mm long and ca 0.5 mm wide; hypanthium ferrugineous-tomentose, rotund, ca 2 mm long, the disk ca 1 mm in diam, sparsely puberulent; calyx-lobes 6, narrowly oblong, ca 4 mm long, ca 1 mm wide, very sparsely tomentose outside, glabrous inside; corolla bright red, the tube 5 to 7 mm long, very sparsely tomentose outside, glabrous inside, the 5 lobes obtuse, ca 2.5 mm long, with an annular callosity at the orifice of the corolla, ca 0.4 mm thick; stamens 5, the filaments ca 1 mm long, attached at the middle of the tube, the anthers oblong, ca 2 mm long; stigma bilobate or trilobate, the style thick and glabrous; ovary 2- or 3-loculate, as indicated by the stigma; placenta obovate, ca 1.3 mm long, ca 1 mm wide, with rectangular ovules. *Fruits* not seen.

CANAL ZONE: Matachin to Las Cascadas, Cowell 359 (NY).

This variety is confined to Cuba, except for one collection from the Canal Zone. It is odd that it has not been recollected in the Canal Zone, one of the most thoroughly collected areas in Panama.

2. *Rondeletia darienensis* Standley, N. Amer. Fl. 32: 53, 1918.

*Branchlets* terete, arachnoid-tomentose when young. *Stipules* narrowly ovate, 7-8 mm long, 1.5-2.5 mm wide, with a sheathing base 5-6 mm wide, abaxially glabrous, adaxially tomentose along the margin and sericeous in the center, the sheathing base tomentose when young. *Leaves* with the petioles 3-18 mm long, arachnose when young; blade elliptic or narrowly ovate, 7.5-17 cm long, 2.5-7 cm wide, acuminate at the apex, cuneate or obtuse at the base, densely grayish arachnoid-tomentose and the midrib and secondary veins raised beneath, the tertiary veins running at right angles to the secondary veins. *Inflorescences* axillary,



modified thyrses, 4-5 cm long, few-flowered, subtended by 2 bracts 3-4 mm long; peduncle 1-1.5 cm long, sparsely arachnoid-tomentose. *Flowers* 4-merous, with 1 or 2 bractlets, pedicellate, the pedicels densely white-arachnoid-tomentose, 1-11 mm long; hypanthium densely white-tomentose, oblong, ca 3 mm long, ca 2 mm wide; calyx-lobes lanceolate, 1-1.3 cm long, 0.2-0.4 cm wide, acute at the apex, arachnoid-tomentose outside, glabrous inside, with 3 parallel veins; corolla (fide Pittier) with the tube 15 mm long, white-woolly-tomentose on the outside, yellow in the throat, the lobes rounded, irregular,  $\pm$  5 mm long; stamens (fide Pittier) attached in the upper  $\frac{1}{2}$  of the tube. *Capsules* (fide Standley) ca 4 mm long.

DARIEN: Boca de Paurando, on Sambu River, S Darien, alt 20 m, Pittier 5684 (holotype US, isotype F).

The inflorescence is a modified thyse composed of three dichasia of which two flowers have been lost from each of the basal dichasia. This species is distinguished by all four calyx-lobes, not just one being expanded, with the lobes lanceolate and 1-1.3 cm long; in addition the under surface of the leaves is densely grayish arachnoid-tomentose. It is known only from the type collection.

3. *Rondeletia buddleioides* Benth. Pl. Hartw. 69, 1840.—Fig. 1.

*Arachnothryx buddleioides* (Benth.) Planchon, Fl. Serres 5: 442, 1849.

*Rondeletia affinis* Hemsley, Diag. Pl. Nov. 28, 1879.

*Tree* or shrub to 15 m high with trunk diam to 15 cm, the branchlets terete or angular, terminally white-tomentose, the older portions brown and glabrous. *Stipules* erect, oblong to narrowly oblong to linear or rarely ovate to broadly ovate to ovate at the base and triangular at the apex, 4-10 mm long, 0.5-5 mm wide. *Leaves* with the petioles 0.3-2 cm long, the younger white-tomentose, the older glabrous; blade ovate to elliptic or obovate, 2.5-21 cm long, 1-7 cm wide, acute to abruptly acuminate at the apex, subobtusate to cuneate or attenuate at the base, sparsely arachnoid-tomentose when young but soon glabrous and asperous or non-asperous above, densely white-tomentose and the midrib raised beneath, the tertiary veins running at right angles to the secondary veins. *Inflorescences* terminal and pseudo-axillary, racemose with equally pedunculate cymules or helicoid-cymules, 2.5-32 cm long; peduncle 0.4-8.5 cm long; main axes densely white-tomentose when young, but soon glabrous. *Flowers* sessile or subsessile, 4-merous; hypanthium densely white arachnoid-tomentose, rotund, 1-1.5 mm long, the disk ca 0.1 mm thick, 0.2-0.6 mm in diam, glabrous; calyx-lobes equal or unequal, basally connate for ca 0.5 mm, triangular or oblong, 0.5-1.7 mm long, ca 0.7 mm wide, reflexed at maturity; corolla with the tube 6-11 mm long, arachnose outside, the basal  $\frac{1}{2}$  sparsely villous inside, the lobes 2-3 mm long and wide, irregularly shaped, arachnoid-tomentose outside, papillate inside; stamens subsessile, attached above the indumentum, the anthers oblong, ca 1.5 mm long; placenta obovate, rarely elliptic, 0.5-0.9 mm long, 0.5-0.7 mm wide, with rectangular ovules. *Capsules* oblong-globose, 3-4 mm long, sparsely tomentose when mature, septicidal.

This is a mountainous species found about 300 m growing in cloud forest. So far, it has been collected on the Pacific slope from Chiriquí to east of the Canal Zone and on the Atlantic slope in Bocas del Toro. It probably will be found along



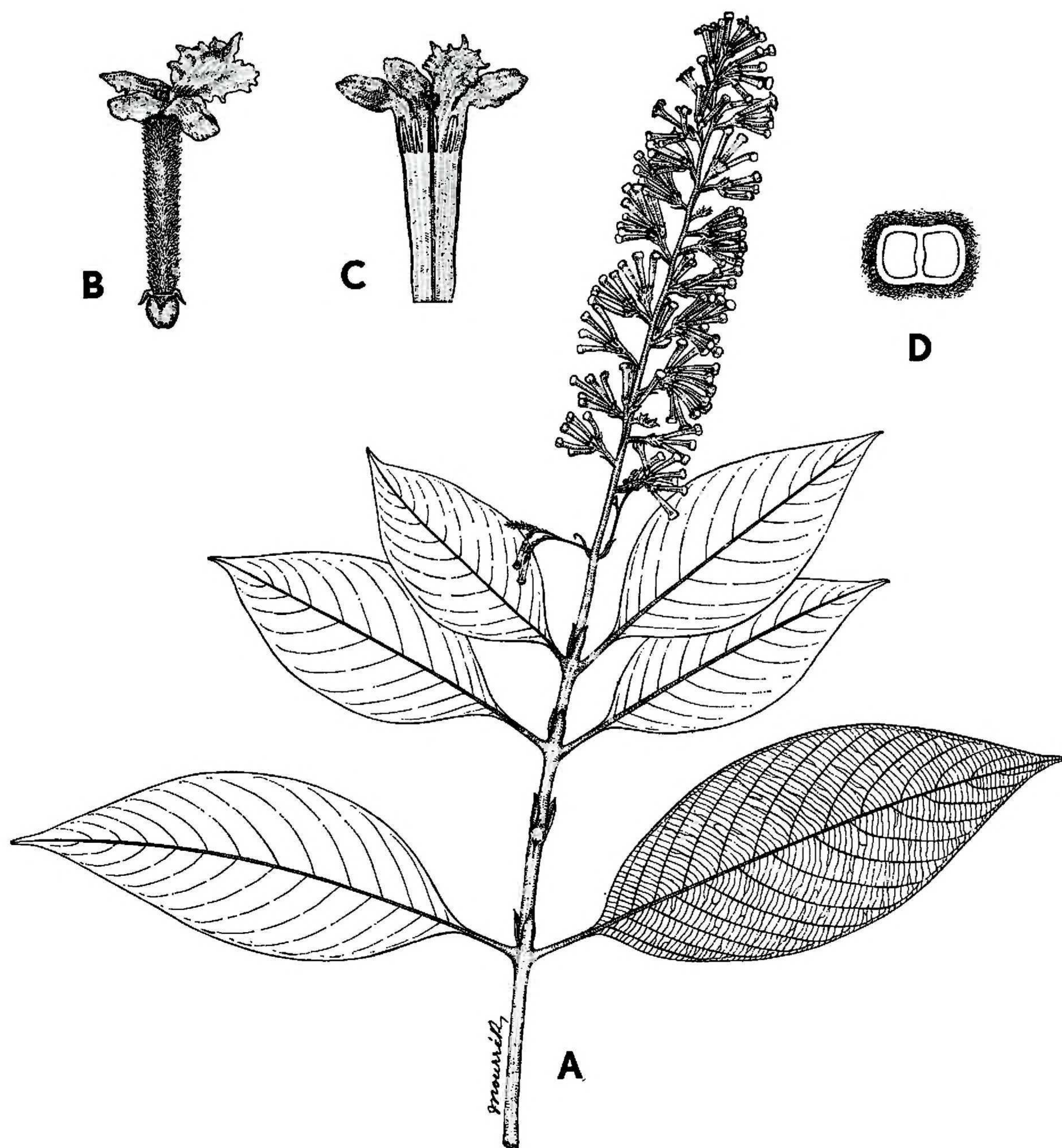


Fig. 1. *Rondeletia buddleioides* Benth.: A, flowering branch ( $\times 1/2$ ); B, flower ( $\text{ca} \times 2 1/2$ ); C, opened corolla-tube ( $\text{ca} \times 2 1/2$ ); D, ovary cross section with placenta and ovules omitted ( $\text{ca} \times 10$ ).

the entire corresponding Atlantic slope also. It ranges from east of the Canal Zone to Mexico, and, judging from the number of collections, is as common at higher elevations across its entire range as it is in Panama.

The isotypes collected in Mexico and deposited in the New York Botanical Garden differ from the Panamanian collections in leaf size, stipule shape, and the length of the peduncles of the cymules. Certain collections from the entire range of the species also show a great deal of variation. A representative sampling of the species across its entire range is necessary before it will be possible to understand its variation and consequent taxonomic ramifications.

The stem bearing a terminal fruiting inflorescence shows at the time of fruit dehiscence, at the uppermost node, a short branchlet from an axillary bud of



several nodes. This eventually develops into a full-size terminal inflorescence. I have used the term pseudo-axillary to describe it.

This species is represented in Panama by two varieties:

- a. Upper surface of the leaf blade non-asperous ..... var. *buddleioides*
- aa. Upper surface of the leaf blade asperous ..... var. *aspera*

3a. *Rondeletia buddleioides* var. *buddleioides*.

CHIRIQUÍ: rocky plains ca 5 mi S of Boquete, Allen 4699 (F); elevated gravel benches 1 mi SW of Boquete, Allen 4718 (F); Finca Lérída, Allen 4753 (MO), Woodson & Schery 222 (F, GH, MO); Bajo Mono-Robalo Trail, Allen 4785 (F, NY), 4829 (F); Finca Collins, Blum & Dwyer 2423A (MO), Ebinger 717 (MO), Stern et al. 1128 (GH, MO, US), 2037 (MO), 2044 (MO); Bajo Charro, Davidson 231 (A, F, MO, US); Volcán de Chiriquí, Davidson 918 (A, F, MO, US); Boquete, Davidson 1060 (A, F, MO, US), Dwyer 6955 (MO), 7004 (MO); Cerro Horqueta, Dwyer et al. 551 (GH, MO, US), von Hagen & von Hagen 2151 (MO), Kirkbride 155 (MO, NY); Llanos Francia, Dwyer & Hayden 7592 (MO), Stern et al. 1199 (GH, MO); 1.5 mi from Boquete towards David, Dwyer & Hayden 7626 (MO); nr Pinola on the Chiriquí Trail, Kirkbride & Duke 864 (MO, NY); betw Pinola & Quebrada Hondo on the Chiriquí Trail, Kirkbride & Duke 905 (MO); betw Pinola & Quebrada Seco on the Chiriquí Trail, Kirkbride & Duke 1023 (MO, NY); valley of the upper Río Chiriquí Viejo, Seibert 240 (A, F, NY), White & White 28 (A, F, MO, NY), 30 (A, F, MO, NY); Callejon Seco, Woodson & Schery 493 (F, GH, MO); Casita Alta, Woodson et al. 885 (A, F, NY), 930 (A, F, NY). COCLÉ: betw Cerro Pilón & El Valle de Antón, Duke & Dwyer 13945 (GH, MO, US); betw Las Margaritas & El Valle, Woodson et al. 1280 (F, MO, NY), 1757 (A, F, MO, NY). PANAMA: Cerro Campana, Allen 2650 (MO, US), Duke 8680 (MO), Dwyer & Kirkbride 7814 (MO), Lewis et al. 1912 (GH, MO, US), McDaniel 6812 (MO); Cerro Azul, Dwyer 1495 (F), 1880 (MO, US), 2069 (MO), Ebinger 394 (MO); Fort Sherman, Piña Highlands, Hayden 120 (MO); Cerro Azul to Cerro Jefe, Tyson et al. 4328 (MO).

3b. *Rondeletia buddleioides* var. **aspera** Kirkbride, var. nov.

Differt a var. *buddleioides* superficie laminae folii aspera.

BOCAS DEL TORO: Buena Vista Camp on the Chiriquí Trail, alt 1000 m, Cooper 615 (F, NY, Y); betw Criollo (just above Buena Vista) & Quebrada Higuera on the Chiriquí Trail, Kirkbride & Duke 780 (holotype MO, isotype NY), 796 (MO, NY).

Standley placed the first collection of this taxon, made by G. Proctor Cooper, in *R. buddleioides* Benth. It has only very immature floral buds and Thomas A. Sprague of Kew (in correspondence with S. J. Record) challenged this specific identification. My recent collection, which bears fruit and more mature floral buds, leaves no doubt that it belongs to *Rondeletia*. Inflorescence, floral, foliar, and stipule characters place it in *R. buddleioides*, but the asperous condition of the upper leaf surface warrants establishing it as a separate variety.

A population of eight to ten trees, to 30 m high with a 3-10 cm diam, is located on the Chiriquí Trail just above Buena Vista. The diagnostic character of the new variety, the asperous leaf-surface, is obvious in the field.

4. *Rondeletia amoena* (Planchon) Hemsley, Diag. Pl. Nov. 26, 1879.—Fig. 2.

*Rogiera amoena* Planchon, Fl. Serres 5: 442, 1849.

*R. menechma* Planchon, loc. cit.

*Rondeletia versicolor* J. Smith, Bot. Mag. tab. 4579, 1851.

*R. latifolia* Oersted, Kjoeb. Vidensk. Meddel. 1852: 43, 1852.

*R. rugosa* Benth. ex Oersted, loc. cit.



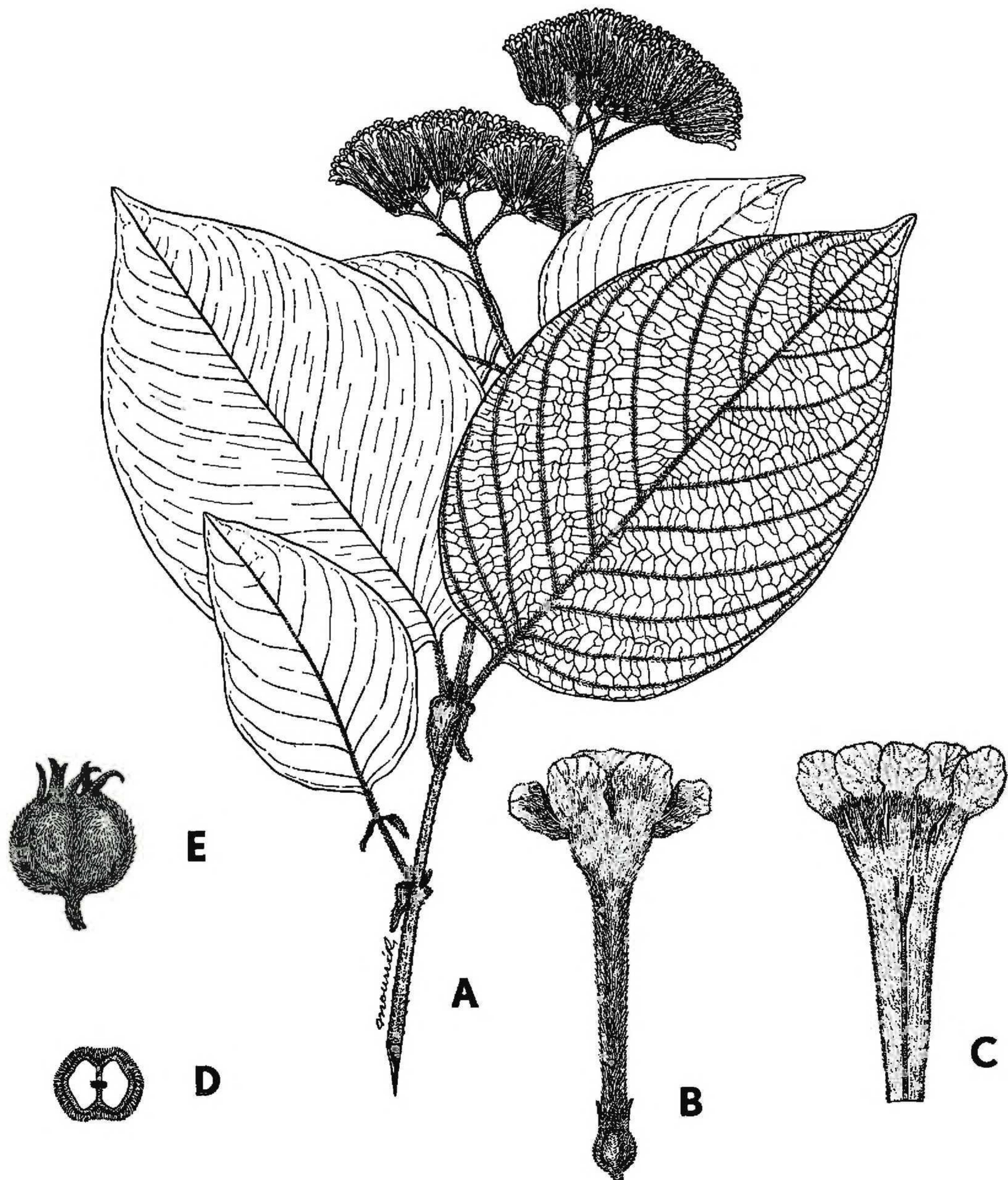


Fig. 2. *Rondeletia amoena* (Planchon) Hemsley: A, flowering branch ( $\times \frac{1}{2}$ ); B, flower ( $\text{ca} \times 2$ ); C, opened corolla ( $\text{ca} \times 2$ ); D, ovary cross section with placenta and ovules omitted ( $\text{ca} \times 3\frac{1}{2}$ ); E, immature fruit ( $\text{ca} \times 2$ ).

*Rogiera latifolia* Decaisne, Rev. Hort. sér. 4, **2**: 121, 1853.

*R. versicolor* Lindley & Paxton, Fl. Gard. **2**: 69, 1853.

*Rondeletia schumanniana* K. Krause, Bot. Jahrb. **40**: 315, 1908.

*Shrub* or tree to 14 m high and 10 cm in diam, the branchlets terete, terminally ferrugineous-pilose, the older portions brown and glabrous. *Stipules* reflexed, triangular to broadly triangular, 4-17 mm long, 3-10 mm wide, obtuse at the apex, sericeous outside, sericeous or puberulous along the edge and glabrous in the center on the inside. *Leaves* with the petioles 3-18 mm long, ferrugineous-pilose when young but soon brown and glabrous; blade subovate to elliptic or very rarely circular, 5.5-20 cm long, 2.7-12.8 cm wide, acute to abruptly acuminate at the apex, obtuse, subtruncate, or subcordate at the base, subcoriaceous, the midrib and secondary veins above with the pubescence strigose and the intercostal areas with



a sparsely strigose pubescence or glabrous, the midrib and secondary veins beneath with the pubescence sericeous or strigose and the intercostal areas sparsely pilose or glabrate, the midrib and secondary veins prominently raised beneath, the tertiary veins open-reticulate. *Inflorescences* terminal and axillary, paniculate, 3.5-16 cm long, ca as broad or broader than long; peduncle 1.5-8.5 cm long; floral axes ferrugineous-pilose, the mature fruiting axes glabrate. *Flowers* with several bractlets, sessile or subsessile, the pedicels white-velutinous, 1-2 mm long; hypanthium densely ferrugineous- or white-tomentose, rotund, ca 2 mm long, the disk ca 0.1 mm thick, ca 0.7 mm in diam, glabrous; calyx-lobes 5-6(-7), unequal, basally connate for ca 0.5 mm, broadly triangular to triangular-oblong, 0.5 mm long, 0.25-0.75 mm wide; corolla with the tube 9-14 mm long, tomentose on the outside, densely yellow-pilose in the throat, with the hairs septate, glandular-pubescent below inside, the lobes 5-6, obtuse, 2-3.5 mm long, sparsely tomentose outside, glabrous inside; stamens attached at ca the middle of the tube, the filaments 1.5-2.5 mm long, the anthers oblong, ca 2 mm long; placenta hemispherical, ca 1.5 mm in diam, with many winged ovules. *Capsules* broadly transverse to transverse elliptic, to 6 mm in diam, tomentose when young, very sparsely tomentose or glabrate when mature, loculicidal.

CHIRIQUÍ: llanos on slopes of Volcán de Chiriquí Viejo & along Río Chiriquí Viejo, Allen 994 (GH, MO); "New Switzerland," Allen 1350 (F, GH, MO, NY, US); Llano del Volcán, Allen 3469 (MO); N forested face of Cerro Copete, Allen 4866 (MO); Finca Collins, Blum & Dwyer 2553 (MO), Dwyer & Hayden 7669 (MO), Stern *et al.* 2002 (MO); Bajo Mono, Davidson 471 (F); Volcán de Chiriquí, Davidson 951 (A, F, MO, US); Cerro Horqueta, Duke *et al.* 13650 (MO); betw Pinola & Quebrada Seco on the Chiriquí Trail, Kirkbride & Duke 1026 (MO, NY), 1036 (MO, NY); Alto Lino, Bro. Maurice 839 (MO); forests around El Boquete, Pittier 2917 (GH, NY, US); Cerro de Lino, Pittier 3024 (US); Camp Aguacatal, E slope of Chiriquí Volcano, Pittier 3120 (US); betw Cerro Vaca & Hato del Loro, Pittier 5388 (US); valley of the upper Río Chiriquí Viejo, White & White 19 (ECON, F, MO); vic of Cerro Punta, White 35 (F, GH,); Río Chiriquí Viejo Valley, White 231 (F, GH, MO); Finca Lérída, Woodson & Schery 227 (F, MO); Finca Lérída to Peña blanca, Woodson & Schery 311 (F, MO); Casita Alta, Woodson *et al.* 810 (A, F, MO, NY).

This species occurs between 1000 and 3000 m elevation from Chiapas, Mexico, to Chiriquí, Panama. It is distinguished by its large reflexed stipules, subcoriaceous leaves, and paniculate inflorescences.

5. *Rondeletia salicifolia* Dwyer & Hayden, *Phytologia* **15**: 58, 1967.

*Shrub* or tree to 8 m high and 6 cm in diam, the branchlets terete, white-tomentose when young, the older portions glabrate. *Stipules* erect, narrowly triangular to triangular or rarely broadly triangular, 3-9.5 mm long, 2-4 mm wide, cuspidate with the cusp 0.5-6.5 mm long, tomentose to glabrate on the outside, sericeous on the inside with several finger-like structures, these ca 0.5 mm long and 0.07 mm in diam, dark red or black when dry. *Leaves* petiolate with the petioles 2-15 mm long, tomentose when young but soon glabrate; blade elliptic to narrowly elliptic, rarely narrowly oblong, narrowly ovate, or narrowly subobovate, 3.5-21 cm long, 1-9 cm wide, long-acuminate at the apex with the acumen 0.5-2 cm long, attenuate to cuneate or subacute at the base, arachnoid-tomentose above and tomentose below when young but soon glabrate above and glabrate or sparsely tomentose



on the veins and the midrib and secondary veins raised beneath, the tertiary veins open reticulate or running at right angles to the secondary veins. *Inflorescences* terminal, axillary and psuedo-axillary, paniculate with the branches helicoid-cymose and often secund, 3.5-12 cm long; peduncle 0.5-6 cm long; axes white-arachnoid-tomentose when young, sparsely tomentose when fruit mature. *Flowers* 4-merous, sessile or pedicellate with the pedicels to 2 mm long, white arachnoid-tomentose; hypanthium sparsely tomentose, rotund, 1.2-2.3 mm long, the disk ca 0.1 mm thick, ca 0.5 mm in diam, glabrous; calyx-lobes glabrous on the inside, with a few appressed hairs on the outside, unequal, basally connate for ca 0.5 mm with 1 lobe 3 or more times longer than the other 3, the larger lobe elliptic or subovate, 6-11.5 mm long, 3.5-6.5 mm wide, acute at the apex, the small lobes elliptic or oblong or triangular, 0.7-3.5 mm long, 0.5-2.7 mm wide, acute at the apex; corolla with the tube 8-15 mm long, with a few appressed hairs on the outside and  $\frac{1}{5}$ - $\frac{1}{2}$  basally puberulent below the anthers inside, the lobes obtuse, 3-4 mm long and wide, glabrous inside, with a few appressed hairs on the outside; stamens variably attached in the tube, the filaments 0.5-2 mm long, the anthers ca 3 mm long; style 6-14 mm long; ovary with a thick septum fused only at the base or completely fused, the placenta V-shaped or elliptic with rectangular ovules. *Capsules* globose, 3-4 mm in diam, costate, glabrate when mature, septicidal, the calyx persistent.

This species is presumably endemic to Panama. It appears to spread over the mountains of the Cerro Jefe region and is found in the western river valleys of Bocas del Toro. Probably, it will be found in the neighboring river valleys of Costa Rica. It appears to be closely related to *R. aetheocalymma* J. D. Smith of Guatemala, which has narrowly oblong stipules, subcoriaceous leaves and larger fruits.

- a. Cusp of the stipule 0.5-2 mm long; mature leaves glabrate beneath, the tertiary veins open reticulate; tube of the corolla ca 15 mm long; septum of the ovary fused only at the base, the placenta V-shaped .....subsp. *salicifolia*
- aa. Cusp of the stipule 3-6.5 mm long; mature leaves sparsely tomentose on the veins beneath, the tertiary veins running at right angles to the secondary veins; tube of the corolla ca 8 mm long; septum of the ovary completely fused, the placenta elliptic .....subsp. *brevicorolla*

5a. *Rondeletia salicifolia* subsp. *salicifolia*.

PANAMA: betw Cerro Jefe & Eneida, alt 700-966 m, *Dwyer et al.* 8215 (MO); Altos de Río Pacora, alt 833 m, *Lewis et al.* 2315 (MO); Cerro Jefe, alt 900-1000 m, *Tyson et al.* 3319 (holotype MO).

This subspecies exhibits a complicated form of heterostyly. When the style is ca 13 mm long, the stigma is ca 1.3 mm long, the stigmatic surface is smooth, the filaments are ca 2 mm long, the stamens are attached ca  $\frac{1}{3}$  of the way up from the base of the tube, and the tube is puberulent ca  $\frac{1}{5}$  of the way up from the base inside. When the style is ca 6 mm long, the stigma is ca 2.5 mm long, the stigmatic surface is densely granulate, the filaments are ca 0.5 mm long, the stamens are attached ca  $\frac{3}{4}$  of the way up the tube from the base, and the tube is puberulent ca  $\frac{1}{2}$  of the way up from the base inside. Heterostyly is also known to occur in a number of other genera of the *Rubiaceae* (Vuilleumier, 1967).



The inflorescences of the holotype are presumably immature. In the maturation of the inflorescence the ovary and calyx lobes develop first, with the floral axes being very short and the corolla only 1-3 mm long. Subsequently, both the corolla and the floral axes lengthen as much as five times. Thus a mature inflorescence is twice the size of the immature inflorescences as represented by those found on the holotype.

5b. *Rondeletia salicifolia* subsp. **brevicorolla** Kirkbride, subsp. nov.

Differt a subsp. *salicifolia* cuspidate stipulae 3-6.5 mm longa, foliis maturis sparsim tomentosis in venis subter, venis tertiariis currentibus in angulis rectis venis secundaris, tubo corollae circa 8 mm longo, septo ovarii omino connato, placenta elliptica.

BOCAS DEL TORO: Changuinola Valley, Cooper & Slater 98 (F); Río Teribe betw Quebrada Huron & Quebrada Schlunjik, alt ca 100 m, Kirkbride & Duke 467 (MO, NY); cloud forest above Quebrada Huron on Cerro Bonyik, alt 166-400 m, Kirkbride & Duke 597 (holotype MO, isotype NY).

This taxon does not appear to be heterostylous. The stamens are attached at ca the middle of the corolla-tube.

6. *Rondeletia cooperi* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 4: 267, 1929.

Tree or shrub to 7 m high and 5 cm in diam, the branchlets terete, terminally densely white-strigose, the older portions sparsely strigose, the internodes unequal, 1.5-25 cm long. Stipules erect, triangular to very depressed triangular, 3-4 mm long, 2-7.5 mm wide, abruptly acuminate with the acumen 0.5-1(-1.5) mm long, strigose or sericeous-strigose on the outside, sericeous on the inside with several finger-like structures, these ca 0.7 mm long and 0.1 mm in diam, dark red when dry. Leaves petiolate with the petioles 0.2-3 cm long, densely strigose when young but sparsely so when mature; blade narrowly elliptic to elliptic, 11-21 cm long, 4.5-9 cm wide, acuminate at the apex with the acumen (1-)1.5-2.5 cm long, attenuate to short-attenuate or cuneate at the base, densely to sparsely strigose on the veins when young but soon glabrate above, strigose to densely white-strigose on the veins when young but soon strigose beneath, the midrib and secondary veins raised beneath, the tertiary veins running  $\pm$  at right angles to the secondary veins. Inflorescences terminal, paniculate with the branches modified compound dichasia, 9-25 cm long; peduncles unequal, 3-16.5 cm long; peduncle and secondary axes strigose, the floral axes densely strigose. Flowers 4-merous, sessile or pedicellate with the pedicels to 1(-3) mm long, densely strigose; hypanthium densely ferrugineous-strigose, oblong, to 2 mm long and 1.3 mm in diam, sericeous-strigose; calyx-lobes basally connate for ca 0.5 mm, 1(or 2) lobes 3 or more times longer than the other (2 or) 3 lobes, the large lobe narrowly elliptic to elliptic or ovate, 3.4-4.3 mm long, 1.2-2.2 mm wide, obtuse at the apex, sparsely strigose on both sides, the small lobes narrowly oblong to oblong or triangular, 0.9-1.3 mm long, 0.3-0.6 mm wide, acute at the apex, sparsely strigose inside, strigose outside; corolla with the tube 9-11 mm long, strigose outside, the lobes obtuse, ca 4 mm long, sericeous-strigose outside near the base. Capsules ovoid, to 4.5 mm long, to 3.5



mm in diam, costate, sparsely strigose when mature, septicidal to ca the middle, calyx lobes persistent; seeds rectangular.

BOCAS DEL TORO: Buena Vista Camp, Chiriquí Trail, alt 416 m, *Cooper 600* (holotype F, isotypes NY, Y); betw Buena Vista coffee finca & Cerro Pilon, Chiriquí Trail, *Kirkbride & Duke 703* (MO, NY); Punta Peña, alt ca 333 m, *Lewis et al. 2158* (MO).

This species is known only from the vicinity of the type locality, an area of rain forest on the Atlantic slope with no appreciable dry season.

*Kirkbride & Duke 703* bears what appear to be two types of fruit, capsules and berries. They have similar internal structures: 2 locules, many ovules, and axile placentation. However, the septum of the baccate fruit has increased in thickness tremendously and the tissues of the septum appear to be abnormal. This abnormal development of the fruit is probably caused by an exterior agent, such as a virus.

7. *Rondeletia secunda* Standley, Contr. U.S. Nat. Herb. **18**: 141, 1916.

*Shrub* with the branchlets terete, terminally sparsely tomentose, the older portions glabrous. *Stipules* erect, triangular, 3-6 mm long, 2-3.5 mm wide, cuspidate with the cusp 1.5-3.5 mm long, connate at the base, glabrous on the outside. *Leaves* subsessile with the petioles 1.5-4.5 mm long, glabrous; blade narrowly elliptic to elliptic or rarely subovate, 7.5-16 cm long, 3.3-6 cm wide, acuminate or rarely abruptly acuminate at the apex, acute or rounded at the base, glabrate on both surfaces, the midrib and secondary veins raised beneath, the tertiary veins running  $\pm$  at right angles to the secondary veins. *Inflorescences* terminal, paniculate with the branches helicoid-cymose and secund, 6-9 cm long; peduncle 4-6 cm long; axes sparsely arachnoid-tomentose but glabrate when the fruit is mature. *Flowers* 4-merous, subsessile, the pedicels to 0.5 mm long, sparsely arachnoid-tomentose; hypanthium very sparsely arachnoid-tomentose, rotund, 0.8-1.5 mm long, the disk ca 0.1 mm thick and 0.5 mm in diam, glabrous; calyx-lobes with a few hairs or glabrous on both sides, unequal, basally connate for ca 0.2 mm, with 3 lobes linear or narrowly oblong, acute or obtuse at the apex, 1.7-4 mm long, 0.2-0.6 mm wide, 1 lobe narrowly obovate, acute or obtuse at the apex, 3.6-7.4 mm long, 0.7-1.4 mm wide, this lobe twice as long as the other 3 lobes; corolla with the tube 9-12 mm long, sparsely villous on the outside, the lobes obtuse, 2-3 mm long, with a few hairs on the outside, papillate on the inside; stamens attached below the middle of the tube. *Capsules* rotund, ca 4 mm in diam and high, when young faintly costate when dry, when mature glabrous and rugose when dry, loculicidal, the calyx lobes persistent until dehiscence; seeds rectangular.

SAN BLAS: Permé *Cooper 229* (F, NY, US); headwaters of Río Cuadí, along the river, alt 91 m, *Duke et al. 3657* (MO); forests around Puerto Obaldía, alt 0-50 m, *Pittier 4279* (holotype US, isotype NY).

This endemic species is known only from the eastern end of San Blas, but it will probably be found in the western end of the province and in Colombia in the area adjacent to San Blas. It is distinguished by its one enlarged calyx-lobe and three linear to narrowly oblong calyx-lobes, 1.7-4 mm long, which persist on the rugose fruit.



8. *Rondeletia bertieroides* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 4: 267, 1929.

*Tree* or rarely shrub with the branchlets terete or subterete, terminally arachnoid-tomentose, the older portions glabrous. *Stipules* erect, triangular to ovate, 4-7 mm long, 2.5-4.5 mm wide, cuspidate with the cusp 1-3 mm long, connate at the base, glabrous on the outside, sericeous on the inside with several finger-like structures, these ca 0.5 mm long and 0.1 mm in diam, red when dry. *Leaves* petiolate with the petioles 0.2-3 cm long, arachnoid-tomentose when young but soon glabrate; blade narrowly elliptic or very rarely elliptic or subovate, 5.5-22.5 cm long, 1.7-6 cm wide, long-acuminate to rarely acute at the apex, attenuate to cuneate or rarely acute at the base, sparsely arachnulose above and arachnose beneath when young, glabrate when mature, the tertiary veins running  $\pm$  at right angles to the secondary veins. *Inflorescences* terminal or very rarely axillary, paniculate with the branches helicoid-cymose or bearing reduced compound dichasia, 7-20 cm long, pedunculate with the peduncles 2.5-5 cm long, or sessile with 2 basal branches (fide Standley) 1-8 cm long, the axes tomentose when young but glabrate when fruit mature. *Flowers* 4-merous, subsessile, the pedicels to 0.5 mm long, tomentose; hypanthium arachnoid-tomentose, rotund, 1.3-1.5 mm long, the disk 0.1-0.2 mm thick, 0.5-0.7 mm in diam, with a few straight erect hairs ca 0.5 mm long or glabrous; calyx-lobes glabrous on the inside, with a few hairs or glabrous on the outside, unequal, basally connate for ca 0.5 mm, with 3 lobes triangular to broadly triangular or oblong, 0.3-1.8 mm long, 0.5-0.9 mm wide, 1 lobe elliptic or narrowly obovate or rarely oblong, acute or very rarely obtuse at the apex, (1.3)2-4.2 mm long, 0.8-2.7 mm wide, this lobe 3 or more times longer than the other 3 lobes, the 3 small lobes reflexed after loss of the corolla; corolla with the tube 9-12 mm long, sparsely strigose on the outside, puberulent on the inside below the anthers, the lobes obtuse, ca 2.5 mm long; stamens subsessile, the filaments of equal length but variably attached, all at the same level in each flower, from below the mouth to the middle of the tube, the anthers 2-2.7 mm long; ovary with a thick entire or incompletely fused septum, the basal fusion ca  $\frac{1}{4}$  of the way up, the placenta elliptic or V-shaped with rectangular ovules. *Capsules* globose, ca 4 mm in diam, costate, glabrous when mature, septicidal, the calyx-lobes persistent.

BOCAS DEL TORO: Buena Vista Camp, Chiriquí Trail, alt 1000 m, Cooper 598 (holotype F, isotypes NY, Y); betw Buena Vista coffee finca & Cerro Pilón, cloud forest, Chiriquí Trail, Kirkbride & Duke 712 (MO, NY), 713 (MO, NY); betw Criollo (just above Buena Vista) & Quebrada Higueron, Chiriquí Trail, Kirkbride & Duke 798 (MO, NY), 799 (MO, NY). COCLÉ: El Valle de Antón, alt 1000 m, Allen 3409 (F); cloud forest on slopes of Cerro Pilón nr El Valle de Antón, alt 700-900 m, Duke 12161 (MO); rain forest on Cerro Caracoral below the elfin forest, Kirkbride 1124 (MO, NY). VECAGUAS: forested slopes of Cerro Tute, vic Santa Fe, alt 800 m. Allen 4368 (F), 4369 (NY).

This endemic species is very heterogeneous. The collections from El Valle generally have smaller leaves, a shorter inflorescence, and more indumentum than do the collections from Bocas del Toro and Cerro Tute, but these characters all overlap, making them useless as key characters. In addition to these differences between the two groups is the fact that the septum of flowers from El Valle was



entire, while the septum of those from Bocas del Toro and Cerro Tute was incompletely fused. My field observations in Bocas del Toro and at El Valle tend to support the separation of the two groups.

It appears that two taxa are involved here, but I am unable at this time to determine any characters in each which would make them readily separable in a key. Perhaps more intensive field work and collecting at all three areas will provide the necessary characters for an adequate separation or for a more positive description of this taxon as a heterogeneous one.

The collections from El Valle also resemble *Rondeletia platysepala* Standley, but *R. platysepala* has all 4 calyx-lobes ca equally expanded.

9. *Rondeletia platysepala* Standley, Ann. Missouri Bot. Gard. **27**: 343, 1940.

*Tree* to 6 m high, the branchlets terete, terminally sparsely strigose, the older portion glabrous. *Stipules* erect, triangular, 2-3 mm long, 1-1.8 mm wide, cuspidate with the cusp ca 0.75 mm long, glabrous on the outside, strigose on the inside with several narrowly elliptic finger-like structures near the apex, these ca 0.5 mm long and 0.2 mm in diam, black when dry. *Leaves* subsessile with the petioles 1-3 mm long, strigose; blade narrowly elliptic or narrowly oblong, 4.4-8 cm long, 1.3-2.3 cm wide, abruptly long-acuminate at the apex, acute at the base, very sparsely tomentose above when young but soon glabrous, the midrib and secondary veins sparsely strigose and the intercostal areas glabrous beneath when mature, the midrib and secondary veins raised beneath, the tertiary veins open-reticulate. *Inflorescences* terminal, paniculate with the branches cymose or helicoid-cymose, 3-9 cm long; peduncle 1.5-4 cm long; axes tomentose. *Flowers* 4-merous, sessile or pedicellate, the pedicels to 5 mm long; hypanthium tomentose, oblong, ca 1.5 mm long, the disk ca 0.3 mm thick and 0.8 mm in diam, glabrous; calyx-lobes ca equal on each flower, laminar-like, elliptic, the apex acute or obtuse, 1.7-4.2 mm long, 0.6-2.5 mm wide, very sparsely tomentose on the outside, very sparsely tomentose to glabrous on the inside; corolla with the tube 7-11 mm long, tomentose on the outside, sparsely puberulous below the middle inside, the lobes obtuse, ca 2.5 mm long; stamens subsessile, the anthers oblong, ca 2 mm long, attached above the middle of the tube; placenta subobovate, ca 1.3 mm long, ca 0.7 mm wide, ca 0.2 mm thick. *Fruits* not seen.

COCLÉ: vic of El Valle, N rim (wet), Allen 1791 (holotype F, isotypes GH, MO, NY).

This endemic resembles *Rondeletia bertieroides* Standley, but it is readily distinguished by its four ca equally expanded calyx-lobes. *Rondeletia bertieroides* has one lobe ca 3 times longer than the other three lobes.

10. *Rondeletia hamelifolia* Dwyer & Hayden, Phytologia **15**: 58, 1967.

*Shrub* 3-8 m high, to 5 cm in diam, the branchlets terete, terminally sparsely tomentose, the older portion glabrous, the internodes of variable length, 0.5-6 cm long. *Stipules* erect, triangular, 4-8 mm long, 2-4 mm wide, cuspidate with the cusp 2-4 mm long, sericeous on the outside and the inside with several narrowly oblong finger-like structures on the inside, ca 1 mm long and 0.2 mm in



diam, black when dry, the stipules below the terminal inflorescence often bilobate. *Leaves* with the petioles to 8 mm long, white-tomentose when young, but soon glabrate; blade narrowly elliptic to elliptic, 4.5-20 cm long, 1.5-6.5 cm wide, acute to acuminate at the apex, attenuate at the base, membranous, very sparsely sericeous on the veins above, tomentose on the midrib and secondary veins and sparsely tomentose on the tertiary veins and the midrib and secondary veins raised beneath, the tertiary veins open reticulate. *Inflorescences* terminal and axillary, paniculate, 2-7(-13) cm long; peduncle 1.5-6 cm long with 2 foliaceous bracts at the apex, narrowly elliptic to elliptic, 1.2-3 cm long, 4-12 mm wide; axes white-tomentose becoming glabrate as the fruit matures. *Flowers* sessile or pedicellate, the pedicels to 3 mm long, white-tomentose; hypanthium white-strigose, rotund, 1.5-2 mm long, the disk ca 0.2 mm thick and 0.8 mm in diam, puberulent; calyx-lobes 5 or 6, unequal, narrowly oblong, the apex acute, 1-2 mm long, very sparsely tomentose outside, sparsely and minutely strigose inside, becoming reflexed at maturity; corolla with the tube 6-9 mm long, white-strigose outside, glabrous inside, the lobes 5, obtuse, ca 2.5 mm long and wide, with an annular callosity ca 0.5 mm thick at the orifice of the corolla; stamens with the filaments ca 1 mm long, attached at the middle of the tube, the anthers oblong, ca 2.5 mm long; placenta hemispherical, ca 0.5 mm in diam, with winged ovules. *Capsules* transversely elliptic in radial section, to 8 mm in diam and 5 mm thick, sparsely puberulous, lightly costate, loculicidal.

LOS SANTOS: Cañístulo, *Dwyer* 2458 (MO). VERAGUAS: Santiago, *Dwyer* 1350 (holotype MO); 4 mi from Pan-Amer Hwy toward Atalaya, *Dwyer & Kirkbride* 7410 (GH, MO, US), 7422 (MO); nr Ponuga, *Dwyer & Kirkbride* 7443 (GH, MO); 2 mi W of Santiago on Pan-Amer Hwy, *Dwyer et al.* 7556 (GH, MO, US); 50 mi W of Santiago on Pan-Amer Hwy, down embankment, *Kirkbride & Hayden* 164 (MO, NY); Cañazas, *Tyson* 3638 (MO).

This endemic species is found in savanna areas of the Azuero Peninsula and Veraguas Province. These areas undergo a very marked dry season each year.

11. *Rondeletia panamensis* DC., Prodr. 4: 408, 1830.—Fig. 3.

*Shrub* or tree to 6 m high and 5 cm in diam, the branchlets terete, terminally white-tomentose, the older portions glabrous. *Stipules* erect, triangular to broadly triangular, 3-5 mm long, 2-7 mm wide, cuspidate with the cusp ca 2 mm long, tomentose on the outside but glabrate when older. *Leaves* with the petioles 2-6(-13) mm long, the younger white-tomentose, the older glabrate; blade narrowly elliptic to broadly elliptic or subovate, 2.5-15 cm long, 1.5-7 cm wide, acute to subacuminate at the apex, subattenuate to attenuate at the base, very sparsely tomentose on the veins and the midrib raised beneath, the tertiary veins running  $\pm$  at right angles to the secondary veins. *Inflorescences* terminal and axillary, of compound dichasia with the secondary axes compressed, 1.5-7 cm long; peduncle 0.5-4 cm long; axes white-tomentose becoming sparsely tomentose as the fruit matures. *Flowers* 5-merous, with several bractlets, sessile or pedicellate, the pedicels to 7 mm long, white-tomentose; hypanthium densely white-tomentose, rotund, ca 2.5 mm long and 3 mm in diam, the disk ca 0.25 mm thick and 0.75 mm in diam, puberulent; calyx basally connate for ca 1.5 mm, the lobes narrowly ovate,



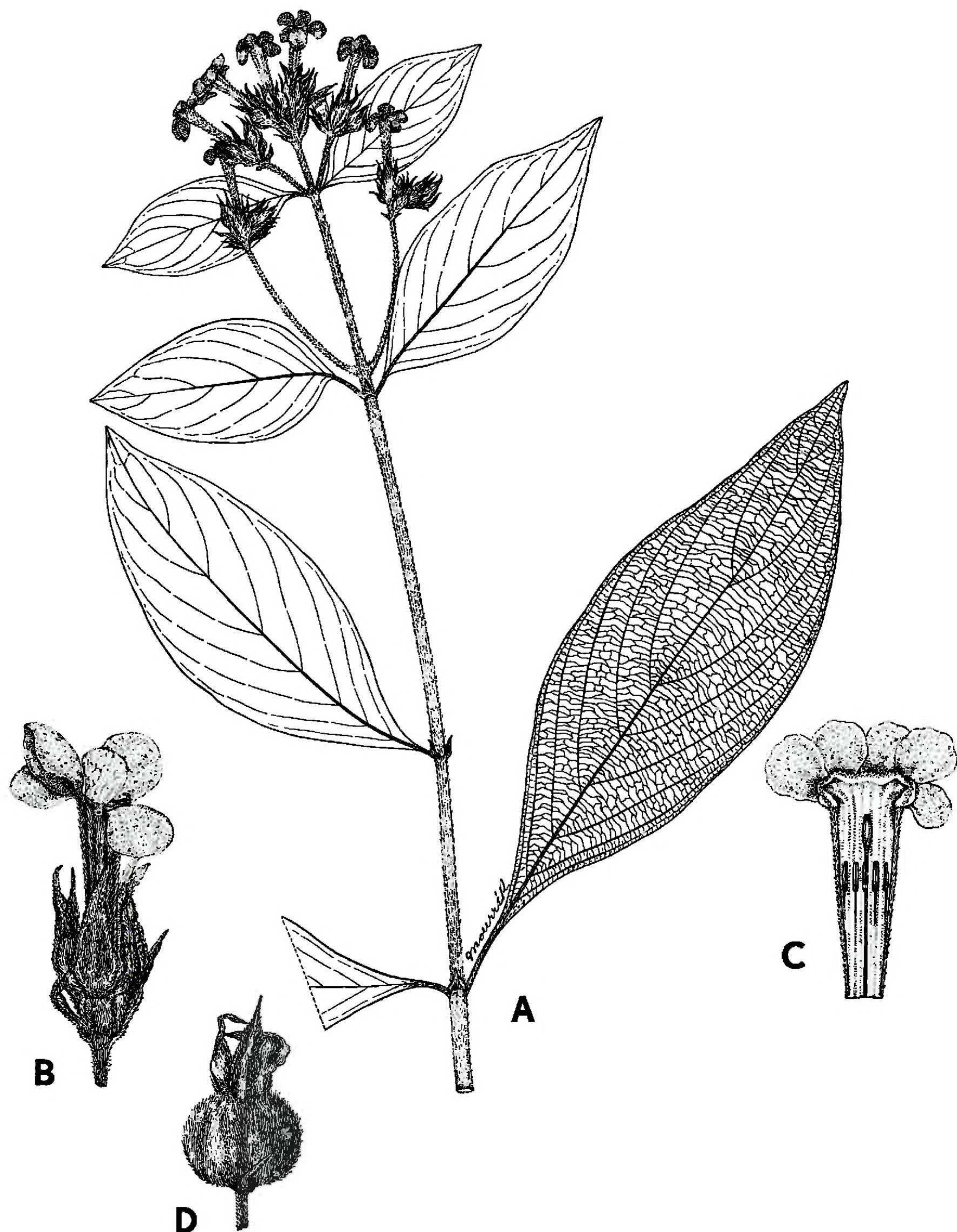


Fig. 3. *Rondeletia panamensis* DC.: A, flowering branch ( $\times \frac{1}{2}$ ); B, flower ( $\times 1\frac{3}{5}$ ); C, opened corolla ( $\times 1\frac{3}{5}$ ); D, immature fruit ( $\times 2$ ).

with the apex acute, ca 8.5 mm long and 2.5 mm wide, ca 1 mm thick near the base, sparsely tomentose outside, densely sericeous at the base and glabrous at the apex inside; corolla with the tube 13-18 mm long, villous-sericeous outside, glabrous inside, the lobes unequal, obtuse, 4 lobes ca 5 mm long and wide, 1 lobe ca 3 mm long and wide, sparsely sericeous in the center outside, sparsely puberulous inside, with an annular callosity ca 0.5 mm thick at the orifice of the corolla; stamens with the filaments ca 2 mm long, attached above the middle of the tube, the anthers oblong, ca 2 mm long; placenta hemispherical, ca 0.5 mm in diam,



with winged ovules. *Capsules*, globose, to 10 mm in diam, sparsely tomentose when mature, loculicidal, 2-valvate, the calyx-lobes persistent.

CANAL ZONE: 2 mi W of Balboa, *Correll* 12257 (GH, NY); forests along banks of Quebrada Fea, Quebrada Pura, & Cañon de Río Chagres, alt 70-100 m, *Dodge & Allen* 17413 (MO); Albrook Site, U.S. Army Tropic Center, *Dwyer* 7123 (MO); Ancón Hill, alt 200 m, *Killip* 3004 (GH, NY), 3054 (US), 12061 (GH), *Piper* 5569 (GH, NY, US), *Williams* 24 (NY); Thunder Hill, Curundu, *McDaniel* 5189 (MO); Sosa Hill, Balboa, *Standley* 25272 (US); Balboa, *Standley* 26996 (A, US); Las Cruces Trail betw Fort Clayton & Corozal, *Standley* 29060 (US); betw Tumba Vieja & Salamanca, alt 66 m, *Steyermark & Allen* 16757 (MO); nr Tropic Survival School, Curundu, *Tyson & Dwyer* 4464 (MO); vic Salamanca Hydrographic Station, Río Pequení, alt ca 80 m, *Woodson et al.* 1562 (A, F, NY). DARIEN: Chepigana, *Duke* 277 (MO); vic Pinas, *Duke* 10626 (MO); Puerto St. Dorotea, *Dwyer* 2203 (MO), 2259 (US). PANAMA: Pan-Am Hwy nr Jenine, *Duke* 3843 (MO); Río Chagres, 1 mi above Madden Lake, *Duke* 4482 (GH, MO); gallery along Río Mamoni, *Duke* 5686 (GH, MO); Río Charco-Espiritu, Tocumen Hwy, *Duke* 5706 (GH, MO); forests of upper Río Mamoni, alt 150-400 m, *Pittier* 4475 (NY, US); Río Tapia, *Standley* 28083 (US). PROVINCE UNKNOWN: *Duchassaing s.n.* (F, GH).

This is a lowland endemic known only from the Canal Zone, the Pacific lowlands of the Province of Panama from the Canal Zone to the Río Bayano, and central Darien. It will probably be found in the Pacific lowlands from the Canal Zone to Darien and possibly in the Choco area of Columbia. It is readily distinguished from other species by its large tomentose fruits bearing the persistent calyx-lobes and its large pubescent flowers.

12. *Rondeletia dukei* Dwyer & Hayden, Ann. Missouri Bot. Gard. **54**: 144, 1967.  
—Fig. 4.

*Shrub* ? with the young portions of the branchlets purplish-black when dry, angular, and glabrous, the older portions of the branchlets brown, terete, and glabrous. *Stipules* erect, triangular to broadly triangular, 3-6 mm long, 2-4 mm wide, glabrous. *Leaves* with the petioles 0.7-3 cm long, purplish-black when dry, ciliate in the axil; blade elliptic-obovate, 5.5-10 cm long, 3.5-6 cm wide, obtuse at the apex, cuneate at the base, rigidly membranous, glabrous, the midrib purplish-black, raised beneath, the tertiary veins open-reticulate. *Inflorescences* terminal or axillary, spike-like, 3.5-8 cm long; peduncle (0.2-)2-4.5 cm long, to 1.5 mm in diam, angular, minutely farinose. *Flowers* with several bractlets, mostly sessile, the occasional pedicels white, to 3 mm long; hypanthium densely white-sericeous, rotund, 1.5-2 mm long, the disk ca 0.4 mm thick and 1 mm in diam; calyx lobes 5(-6), basally connate for ca 0.5 mm, rotund to broadly ovate, ca 1.5 mm long, 1.5-2 mm wide, 1 or 2 calycine lobes of the lowest flowers disposed as broad foliose blades, the stalk linear, to 3 mm long, the blade broadly ovate, to 3.5 cm long, cuneate, brownish-yellow when dry; corolla with the tube 1-8 mm long, strigose outside, villous at the throat, the lobes 5-6, 2-3 mm long, obtuse, puberulent outside, papillate and purple when dry inside, patulous at anthesis; filaments unequal, 0.3-3 mm long, attached at the throat of the corolla-tube; anthers 5 or 6, oblong, 1.5-5 mm long, subversatile, some sessile, some exserted; stigma exserted; placenta oblong, ca 1.5 mm long, ca 0.1 mm wide, ca 0.25 mm high, with the ovules winged when immature. *Fruits* not seen.

DARIEN: Río Pirre, *Duke* 8329 (holotype MO, isotype NY).



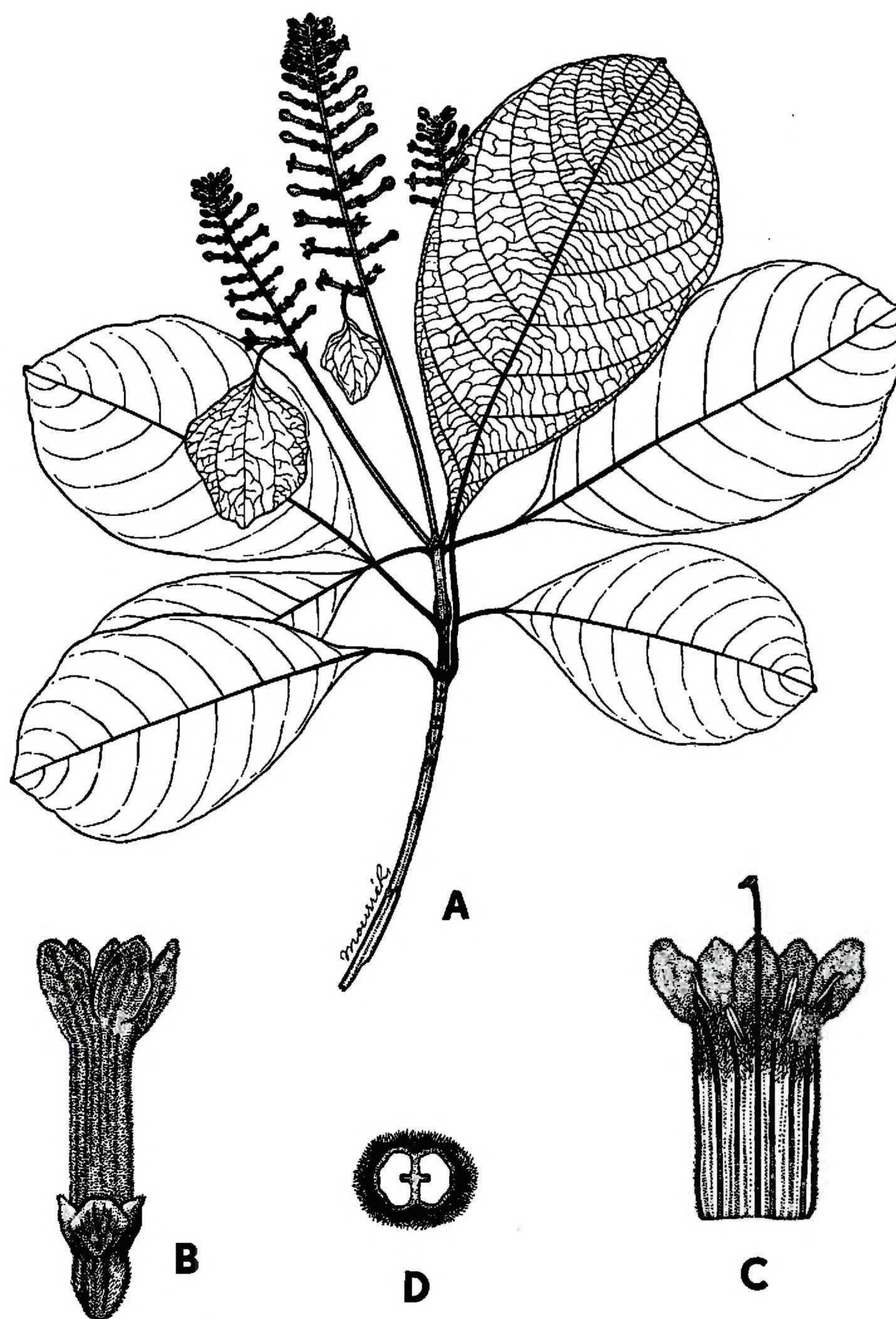


Fig. 4 *Rondeletia dukei* Dwyer & Hayden: A, flowering branch ( $\times 1/2$ ); B, flower ( $\times 3 1/2$ ); C, opened corolla ( $\times 3 1/2$ ); D, ovary cross section with placenta and ovules omitted ( $\times 8 1/2$ ).

This species differs from the others in Panama by its extremely large foliar calyx-lobes on the lowest flowers of the inflorescence and its filaments of variable length. On the specimens observed, 10 of the 12 leaves had deformed apices of their blades.

This species is known only from the type collection. The common name found on the label, *madroño* according to the collector probably denotes the large foliar calyx-lobes, and is probably not species specific.



## EXCLUDED SPECIES

*Rondeletia laniflora* Benth. Pl. Hartw. 85, 1841.

*Arachnothryx laniflora* (Benth.) Planchon, Fl. Serres 5: 442, 1849.

This taxon resembles *Rondeletia buddleioides* Benth. somewhat. It is reported by Seemann (1854) to have been collected on Chiriquí Volcano; the specimen was not available for examination, but may be a misidentified *R. buddleioides*.

*Rondeletia nicaraguensis* Oersted, Kjoeb. Vidensk. Meddel. 1852: 43, 1852.

This taxon was described from Nicaragua and reported from Panama by Oersted. The description of the corolla and leaves seems unusual for *Rondeletia*, and neither the ovarian nor the fruit structure was described. No specimen was available for examination.

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